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Multiplex PCR for detection and typing of porcine circoviruses.

Ouardani M, Wilson L, Jette R, Montpetit C, Dea S

Related Resources

Centre de Microbiologie et Biotechnologie, INRS-Institut Armand-Frappier, Université du Québec, Laval, Québec, Canada, H7N 4Z3.

Sets of oligonucleotide primers were designed according to the sequences of the open reading frames (ORFs) ORF1 and ORF2 of the prototype nonpathogenic PK-15 strain of porcine circovirus (PCV) type 1 (PCV-1). By the PCR performed with the various primer sets, genomic DNA or RNA from other bacterial or viral pathogens of the respiratory tracts of pigs could not be amplified. A positive amplification reaction could be visualized with DNA extracted from a viral suspension containing as few as 10 viral particles per ml. No DNA fragment could be amplified from lysates of continuous porcine cell lines (PT, ST, and PFT cells) known to be negative for PCV. When tested with clinical samples from pigs, the results of the single PCR method showed nearly 93% (13 of 14 samples) correlation with histopathological and immunohistochemical findings. Interestingly, subclinical PCV infections could be detected by single PCR with clinical samples that have been submitted from animals with irrelevant cases of respiratory and/or enteric problems. On the basis of the nucleotide sequences of PCV strains (PCV-2) recently associated with outbreaks of postweaning multisystemic wasting syndrome (PWMS) in Quebec, Canada, pig farms, other primers were designed from the PCV-1 genome, and these primers failed to amplify genomic fragments specific to the ORF1 or ORF2 genes of clinical isolates associated with PWMS but amplified DNA from the PCV-1 strain. Two rapid multiplex PCR (mPCR) methods have been developed to distinguish between both genotypes of PCV. By those two mPCR methods, (i) species-specific

primer pairs were used to amplify a DNA fragment of 488 bp specific for the ORF2 genes of both genotypes, whereas a 375-bp fragment was amplified from the ORF1 gene of the PCV-1 strain only, or (ii) species-specific primer pairs were used to amplify a DNA fragment of 646 bp specific for the ORF1 genes of both genotypes, whereas a 425-bp fragment was amplified from the ORF2 gene of the PCV-1 strain only. By both mPCR methods, a PCV-2 infection was demonstrated in tissues of 94.2% (33 of 35) of the sick pigs tested, in agreement with previous findings showing the close association of this new genotype of PCV with outbreaks of PMWS in Europe and North America. On the other hand, a PCV-1 infection was confirmed in only 5.7% (2 of 35) of the pigs, and confirmation of a mixed infection with PCV-2 was obtained by a single PCR with PCV-2-specific primers.

PMID: 10565907, UI: 20033628

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L2 32 S PMWS
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L3 2027 S E3
L4 0 S L2 AND L3
L5 7 S CIRCOVIRUS TYPE 2
L6 0 S CIRCOVIRUS TYPE II
L7 110 S CIRCOVIRUS
L8 1 S L7 AND L3

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L9 0 S L7 AND L3
L10 83 S CIRCOVIRUS
L11 20602 S TYPE 2
L12 3 S L11 AND L10

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	E BABLUK L/AU
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L3	62 S CIRCOVIRUS
L4	0 S L1 AND L3
L5	312778 S PIG?
L6	51 S L1 AND L5
L7	1 S "PCVII"
	E WILSON P/AU
L8	392 S E3
L9	7 S L5 AND L8
L10	1 S CIRCOVIRUS TYPE II
L11	17 S PMWS
L12	0 S L11 AND L1

PB American Society for Microbiology
DT Journal
LA English

L9 ANSWER 7 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1998:303220 CAPLUS
DN 129:91137

TI Nucleotide sequence of porcine circovirus associated with postweaning
multisystemic wasting syndrome in pigs

AU Hamel, Andre L.; Lin, Lihua L.; Nayar, Gopi P. S.

CS Virology Laboratory, Manitoba Agriculture, Veterinary Services, Winnipeg,
MB, R3T 5S6, Can.

SO J. Virol. (1998), 72(6), 5262-5267
CODEN: JOVIAM; ISSN: 0022-538X

PB American Society for Microbiology
DT Journal
LA English

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- L3 ANSWER 1 OF 24 CABA COPYRIGHT 2000 CABI
TI In-situ hybridization for the detection of porcine circovirus in pigs with postweaning multisystemic wasting syndrome.
- L3 ANSWER 2 OF 24 CABA COPYRIGHT 2000 CABI
TI Lack of evidence of conserved lentiviral sequences in pigs with post weaning multisystemic wasting syndrome.
- L3 ANSWER 3 OF 24 CABA COPYRIGHT 2000 CABI
TI A comparison of in situ hybridization and immunohistochemistry for the detection of a new porcine circovirus in formalin-fixed tissues from pigs with post-weaning multisystemic wasting syndrome (**PMWS**).
- L3 ANSWER 4 OF 24 CABA COPYRIGHT 2000 CABI
TI [Post-weaning multisystemic wasting syndrome (**PMWS**)].
La maladie de l'amaigrissement du porcelet (M.A.P.).
- L3 ANSWER 5 OF 24 CABA COPYRIGHT 2000 CABI
TI Identification and incidence of porcine circovirus in routine field cases in Quebec as determined by PCR.
- L3 ANSWER 6 OF 24 CABA COPYRIGHT 2000 CABI
TI Experimental inoculation of conventional pigs with tissue homogenates from pigs with post-weaning multisystemic wasting syndrome.
- L3 ANSWER 7 OF 24 CABA COPYRIGHT 2000 CABI
TI Postweaning multisystemic wasting syndrome (**PMWS**).
- L3 ANSWER 8 OF 24 CABA COPYRIGHT 2000 CABI
TI Experimental reproduction of severe wasting disease by co-infection of pigs with porcine circovirus and porcine parvovirus.
- L3 ANSWER 9 OF 24 CABA COPYRIGHT 2000 CABI
TI Typing of porcine circovirus in clinical specimens by multiplex PCR.
- L3 ANSWER 10 OF 24 CABA COPYRIGHT 2000 CABI
TI Identification of porcine circoviruses with genetic variation from lymph nodes collected in pigs with **PMWS**.
- L3 ANSWER 11 OF 24 CABA COPYRIGHT 2000 CABI
TI [Postweaning multisystemic wasting syndrome [pigs]].
Syndrom multisystemoveho chradnuti selat po odstavu (Post-Weaning Multisystemic Wasting Syndrome - **PMWS**).
- L3 ANSWER 12 OF 24 CABA COPYRIGHT 2000 CABI
TI Proceedings of the Pig Veterinary Society, Derby, UK, 12-13 November 1998.
- L3 ANSWER 13 OF 24 CABA COPYRIGHT 2000 CABI
TI Post-weaning multi-systemic wasting syndrome (**PMWS**) in pigs - a review and assessment of the situation in the United Kingdom.
- L3 ANSWER 14 OF 24 CABA COPYRIGHT 2000 CABI
TI Reproduction of lesions of postweaning multisystemic wasting syndrome in gnotobiotic piglets.

L3 ANSWER 15 OF 24 CABA COPYRIGHT 2000 CABI
TI Postweaning multisystemic wasting syndrome: epidemiology and clinical presentation.

L3 ANSWER 16 OF 24 CABA COPYRIGHT 2000 CABI
TI Pathological, immunohistochemical, and in-situ hybridization studies of natural cases of postweaning multisystemic wasting syndrome (**PMWS**) in pigs.

L3 ANSWER 17 OF 24 CABA COPYRIGHT 2000 CABI
TI Case presentations of **PMWS** [post-weaning multisystemic wasting syndrome].

L3 ANSWER 18 OF 24 CABA COPYRIGHT 2000 CABI
TI Porcine circovirus: is it the cause of **PMWS** [post-weaning multisystemic wasting syndrome] in younger pigs?.

L3 ANSWER 19 OF 24 CABA COPYRIGHT 2000 CABI
TI Detection of a novel strain of porcine circovirus in pigs with postweaning multisystemic wasting syndrome.

L3 ANSWER 20 OF 24 CABA COPYRIGHT 2000 CABI
TI Nucleotide sequence of porcine circovirus associated with postweaning multisystemic wasting syndrome in pigs.

L3 ANSWER 21 OF 24 CABA COPYRIGHT 2000 CABI
TI Porcine circovirus infection in Northern Ireland.

L3 ANSWER 22 OF 24 CABA COPYRIGHT 2000 CABI
TI Isolation of circovirus from lesions of pigs with postweaning multisystemic wasting syndrome.

L3 ANSWER 23 OF 24 CABA COPYRIGHT 2000 CABI
TI Recognizing and diagnosing postweaning multisystemic wasting syndrome (**PMWS**).

L3 ANSWER 24 OF 24 CABA COPYRIGHT 2000 CABI
TI Detection and characterization of porcine circovirus associated with postweaning multisystemic wasting syndrome in pigs.

> d 19 1-7

L9 ANSWER 1 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1999:809485 CAPLUS
TI Multiplex PCR for detection and typing of porcine circoviruses
AU Ouardani, M.; Wilson, L.; Jette, R.; Montpetit, C.; Dea, S.
CS Centre de Microbiologie et Biotechnologie, INRS-Institut Armand-Frappier,
Universite du Quebec, Laval, PQ, H7N 4Z3, Can.
SO J. Clin. Microbiol. (1999), 37(12), 3917-3924
CODEN: JCMIDW; ISSN: 0095-1137
PB American Society for Microbiology
DT Journal
LA English

L9 ANSWER 2 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1999:600830 CAPLUS
DN 131:282138
TI A comparison of in situ hybridization and immunohistochemistry for the
detection of a new porcine circovirus in formalin-fixed tissues from pigs
with post-weaning multisystemic wasting syndrome (PMWS)
AU McNeilly, F.; Kennedy, S.; Moffett, D.; Meehan, B. M.; Foster, J. C.;
Clarke, E. G.; Ellis, J. A.; Haines, D. M.; Adair, B. M.; Allan, G. M.
CS Virology Section, Veterinary Sciences Division, Department of Agriculture
for Northern Ireland, Belfast, BT4 3SD, UK
SO J. Virol. Methods (1999), 80(2), 123-128
CODEN: JVMEDH; ISSN: 0166-0934
PB Elsevier Science B.V.
DT Journal
LA English

L9 ANSWER 3 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1999:390419 CAPLUS
DN 131:40578
TI Isolation and characterization of a new porcine circovirus, PCVII, and
its role in the diagnosis and treatment of postweaning multisystemic wasting
syndrome
IN Wang, Li; Babiuk, Lorne A.; Potter, Andrew A.; Willson, Philip
PA University of Saskatchewan, Can.
SO PCT Int. Appl., 82 pp.
CODEN: PIXXD2
DT Patent
LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	WO 9929717	A2	19990617	WO 1998-CA1130	19981211
	WO 9929717	A3	19991007		
	W:	AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ,			
TM		RW:	GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG		
	AU 9915526	A1	19990628	AU 1999-15526	19981211
PRAI	US 1997-69233		19971211		

US 1997-69750 19971216
US 1997-PV69233 19971211
US 1997-PV69750 19971216
WO 1998-CA1130 19981211

L9 ANSWER 4 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1999:340252 CAPLUS
DN 131:194958
TI Typing of porcine circovirus in clinical specimens by multiplex PCR
AU Larochelle, R.; Antaya, M.; Morin, M.; Magar, R.
CS Laboratoire d'Hygiene Veterinaire et Alimentaire, Agence Canadienne
d'Inspection des Aliments, Saint-Hyacinthe, PQ, Can.
SO J. Virol. Methods (1999), 80(1), 69-75
CODEN: JVMDH; ISSN: 0166-0934
PB Elsevier Science B.V.
DT Journal
LA English

L9 ANSWER 5 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1999:244762 CAPLUS
DN 130:292453
TI Porcine circoviruses, vaccines and diagnostic reagents
IN Allan, Gordon; Meehan, Brian; Clark, Edward; Ellis, John; Haines,
Deborah;
Hassard, Lori; Harding, John; Charreyre, Catherine Elisabeth; Chappuis,
Gilles Emile
PA Merial, Fr.; The Queen's University of Belfast; University of
Saskatchewan
SO PCT Int. Appl., 57 pp.
CODEN: PIXXD2
DT Patent
LA French

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	WO 9918214	A1	19990415	WO 1998-FR2107	19981001
	W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE,				
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	KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW,				
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	FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI,				
	CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	FR 2769321	A1	19990409	FR 1997-12382	19971003
	FR 2769322	A1	19990409	FR 1998-873	19980122
	FR 2776294	A1	19990924	FR 1998-3707	19980320
	AU 9893555	A1	19990427	AU 1998-93555	19981001
PRAI	FR 1997-12382		19971003		
	FR 1998-873		19980122		
	FR 1998-3707		19980320		
	WO 1998-FR2107		19981001		

L9 ANSWER 6 OF 7 CAPLUS COPYRIGHT 2000 ACS
AN 1998:583230 CAPLUS
DN 129:328036
TI Detection of a novel strain of porcine circovirus in pigs with
postweaning
multisystemic wasting syndrome
AU Morozov, Igor; Sirinarumitr, Theerapol; Sorden, Steven D.; Halbur,
Patrick
G.; Morgan, Marsha K.; Yoon, Kyoung-Jin; Paul, Prem S.
CS Veterinary Medical Research Institute, College of Veterinary Medicine,
Iowa State University, Ames, IA, 50011, USA
SO J. Clin. Microbiol. (1998), 36(9), 2535-2541
CODEN: JCMIDW; ISSN: 0095-1137